



**General Certificate of Education (A-level)  
January 2011**

**Biology**

**BIOL1**

**(Specification 2410)**

**Unit 1: Biology and Disease**

***Report on the Examination***

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## General Comments

The paper produced a wide range of marks and proved to be accessible across the full ability range. As in the previous series, there were some truly outstanding scripts at the top of this range and it is encouraging that a greater percentage of candidates gained marks in the fifties. Many scripts conveyed an excellent grasp of subject knowledge and the ability to apply this to unfamiliar contexts. It was also pleasing to see candidates showing a better understanding of *How Science Works*. At the other end of the scale, it was clear that there were some candidates who were ill-prepared for this examination. They struggled with basic recall and found questions that required application of knowledge demanding. These candidates often failed to gain marks through poor expression. This was most notable in Questions 6 and 7. Similarly, the course of infection of pulmonary tuberculosis was poorly understood.

Centres should encourage candidates to take into account the number of marks allocated to each question and write relevant answers of an appropriate length. Routinely extending answers to extra pages is unnecessary and can result in candidates falling short of time later in the unit test.

### Question 1

- (a) Just over 75% of candidates correctly named **A** as the membrane. The most common responses seen that did not gain credit were 'cell wall' and 'capsule'.
- (b) Many candidates gained two marks for 'nucleus', 'mitochondrion', 'Golgi', 'smooth/rough ER' or 'heavier ribosomes'. Unfortunately, some candidates failed to gain a mark due to a lack of detail. This was usually for failing to qualify 'ribosomes' or stating 'villi' instead of microvilli. A minority of weaker candidates failed to score through failing to read the question stem with sufficient care. They named structures that were present in a cholera bacterium but absent from an epithelial cell.
- (c) A common misconception seen by weaker candidates in both question parts was that a TEM or SEM can be used to view living specimens. Vague references to cost and preparation were not uncommon. A few candidates confused the two types of electron microscope.
  - (c)(i) Two thirds of candidates were aware that a TEM provides a higher resolution or that it can be used to view the internal structures within cells.
  - (c)(ii) Just over half of candidates were aware that an SEM allows a 3-D image, thicker sections to be prepared or the surface of a specimen to be viewed. Some candidates stated that an SEM provides colour images. This was not credited. Both types of electron microscope produce black and white images, which can then be enhanced with colour, using computer software.
- (d) Just over 40% of candidates scored full marks. Many candidates were aware of the equation used to calculate the actual width of the cholera bacterium. However, the ability to convert millimeters to micrometres proved to be a good discriminator. Where candidates had expressed their answer in standard form, this was usually done poorly. A common error seen by weaker candidates was to multiply the measured length and magnification.
- (e) Almost all candidates gained one mark for correctly describing the relationship between height above sea level and the number of deaths from cholera. However, a few then went on to disqualify this mark by referring to this as a 'positive correlation'.

Some weaker candidates referred to the 'sea level increasing' rather than the height above sea level increasing.

### Question 2

- (a) Most candidates gained one mark for the idea that a change in the shape of the enzyme allows the substrate to fit. Surprisingly, it was usually only better candidates that referred to the active site of the enzyme. Some weaker candidates placed the active site on the substrate.
- (b) Half of the candidates gained this mark for stating that the active site is a fixed shape in the lock and key model or already complementary to the substrate. Weaker candidates did not refer to the active site.
- (c) Over half of the candidates gained at least two marks for noting that sulfanilamide acts as a competitive inhibitor, which prevents PABA from binding. Many candidates were also aware of the importance of shape. However, this mark was sometimes disqualified for stating that sulfanilamide and PABA are the *same* shape. Weaker candidates were let down by poor expression. They referred to 'inhibiting bacteria' or placed the active site on PABA or sulfanilamide. A minority of candidates focused on folic *acid* and went on to describe enzyme denaturation by the acid. Few candidates took the non-competitive inhibitor route of the mark scheme. However, those who did often scored two marks.

### Question 3

- (a)(i) 71% of candidates gave the correct response **G**.
- (a)(ii) 70% of candidates gave the correct response **E**.
- (b) Many candidates gave a comparative response that clearly showed that the pressure was higher below the valve. However, weaker candidates often failed to make a comparison and often simply stated that 'the pressure in the ventricles increases'. Where a comparison was made, this was often between the ventricles and the atria.
- (c) Many candidates gained one mark for stating that the delay allows the atria to empty or the ventricles to fill. However, it was usually only better candidates who were able to take this further and explain that it delayed contraction of the ventricles. Weaker candidates often thought that the delay allows valves to close or gave unnecessary detail involving the Bundle of His and Purkyne fibres.
- (d)(i) 75% of candidates gained full credit on this question. However, most candidates were aware how to calculate stroke volume and gained one mark. The minority of candidates who failed to score typically multiplied cardiac output and heart rate. This gave a stroke volume of 275,000 cm<sup>3</sup>. Candidates should be encouraged to check that their final answer does not seem unreasonable.
- (d)(ii) Many candidates scored at least one mark. Better candidates had no trouble in relating training to an increase in heart muscle or size. They usually then went on to explain the consequence of this in terms of an increase in the stroke volume. Weaker candidates were often let down by poor expression. Vague statements such as 'the heart is stronger' and 'the heart pumps more blood' were common. Some of these candidates related a lower heart rate to less oxygen being needed after exercise. It was clear that a minority of candidates thought that the term 'after exercise' referred to a single training session, rather than a prolonged training programme, as stated in the stem of the question. A minority of candidates related a lower heart rate to ventilation.

#### Question 4

- (a) 42% of candidates were aware that an unsaturated fatty acid contains carbon-carbon double bonds and gained full credit. However, most candidates gained one mark for the idea of double bonds. Weaker candidates often wrote about the health benefits of unsaturated fatty acids.
- (b) Nearly 60% of candidates gained at least two marks. This was typically for appreciating that the graph shows a reduced risk, not prevention, of coronary heart disease or that other factors may also reduce the risk. Many candidates also described the negative correlation. However, weaker candidates sometimes left this as 'there is a correlation'.
- (c)(i) Just over 60% of candidates correctly identified **X** as a glycosidic bond. Common incorrect responses seen were 'peptide', 'ester', 'ionic', 'covalent' and 'hydrogen'.
- (c)(ii) Just over half of the candidates gained the mark for stating that a triglyceride contains glycerol or three fatty acids. However, some candidates clearly confused a triglyceride with a phospholipid and made reference to a phosphate group or two fatty acids. Weaker candidates were often let down by poor expression or a lack of detail. These candidates often referred to a triglyceride containing three glycerol molecules and some confused glycerol with glycogen.
- (c)(iii) Only 20% of candidates gave the correct response **9**.

#### Question 5

- (a) 60% of candidates gained one mark for the idea that water on the outside of the cylinders would affect the mass, or that only the water taken up or lost should be measured. Only the very best candidates were aware that the amount of water on the cylinders would vary. A common response by weaker candidates was that water on the outside of the cylinders would allow further osmosis before reweighing. This was not credited. Vague responses that referred to greater reliability or accuracy were common.
- (b) One third of candidates gave the correct volumes of **4cm<sup>3</sup>** and **16cm<sup>3</sup>**.
- (c) It was encouraging to note that candidates did better on this question than they did on a comparable question in January 2010. One third of candidates gained full credit. Many were aware that expressing a change as a percentage allows a comparison to be made. However, it was usually only better candidates who wrote that the cylinders would have different starting masses. The stem of the question made it clear that both the starting and final masses of the cylinders were recorded. It therefore had to be clear to which of these the candidates was referring. Weaker candidates often referred to 'different sizes' or 'different masses'. These responses were not credited.
- (d) Two thirds of candidates gained one mark for the idea that anomalies could be identified. However, some thought that repeats prevented anomalies from occurring or being recorded. It was only the very able candidates who wrote that repeats allow a more reliable mean to be calculated. Taking additional readings does not necessarily allow results to be closer to the true value. Hence, references to 'a more accurate mean' were not credited. Weaker candidates often referred to 'the results' being more reliable or more accurate without qualifying their answers.
- (e) 70% of candidates correctly read off the intercept on the x-axis at 0.35 mol dm<sup>-3</sup>.

### Question 6

- (a) Two thirds of candidates were aware that the vaccine needed to be given before girls are sexually active or likely to carry HPV. However, this was often poorly expressed by weaker candidates e.g. 'this is when girls reach puberty or are sexually mature'. Other typical responses attempted to explain why the vaccine was given in general terms, rather than to this specific age group e.g. 'to prevent girls developing cancer later in life'.
- (b) One third of the candidates had the idea that different types of HPV have different antigens. However, only better candidates wrote about the consequence of this in terms of memory cells and antibodies. Weaker candidates were let down by poor expression. Responses such as 'the immune system does not recognise the virus', 'memory cells do not remember the virus' and 'antibodies cannot fight the virus' were seen. A minority of candidates thought that the vaccine contained antibodies.
- (c) Nearly half of the candidates had the idea that more memory cells or more antibodies would be produced. However, only the very best candidates mentioned both for full credit. Two misconceptions were seen in the responses of weaker candidates. The first was that each injection of the vaccine was based on a different strain of HPV and would therefore provide 'better immunity'. The second involved safety. They thought that 'if given all at once, the immune response would be too strong'. Similarly, many unqualified references to the primary and secondary responses were seen.
- (d) Two thirds of the candidates gained at least one mark for stating that cancer takes many years to develop or that it takes time for young girls to become sexually active. Candidates who failed to score often wrote that 'it takes time to develop immunity' or 'it takes many years to obtain data'. Some weaker candidates wrote about immunity being passed on to offspring or that it would take many years to vaccinate 80% of 12-13 year olds.
- (e) 75% of candidates gained full credit for stating that cancer can be caused by other factors or that the vaccine may not work. Weaker candidates often repeated information in the passage and wrote that smear tests are needed to remove abnormal cells before cancer develops. A minority thought that cancer is infectious and that smear tests detect the virus.
- (f) Only better candidates were aware that people who are vaccinated will destroy the virus or not act as carriers. Very few of these candidates appreciated that people who are not vaccinated are therefore more likely to meet people who are vaccinated. Many candidates simply repeated the stem of the question and stated that 'if vaccinated, people cannot spread HPV to others'. Weaker candidates often referred to the 'disease' being destroyed rather than the virus.

### Question 7

- (a) Many candidates were aware of how pulmonary tuberculosis is transmitted. However, the course of infection was poorly understood. There are nine marking points on the mark scheme for this question. Despite this, only 25% of candidates scored at least three or more marks. The most common marks awarded were for the transmission of bacteria in droplets, their containment in a tubercle and the formation of scar tissue. It was usually only better candidates who were aware of engulfment by phagocytes, the dormant stage of disease and the role of immunosuppression in allowing the activation of bacteria at a later date. Weaker candidates often stated that transmission is via 'coughing', 'sneezing' or 'through the air'. Some thought that pulmonary tuberculosis was caused by a virus. Similarly, these candidates frequently went into unnecessary detail about the symptoms of pulmonary tuberculosis and the

social conditions that would increase the chance of transmission. Some candidates confused pulmonary tuberculosis with emphysema. A minority of weaker candidates wrote about infection in the pulmonary artery or vein. This is in contrast to some truly excellent descriptions of the course of infection by the best candidates.

- (b) Most candidates scored at least three marks and all marking points were regularly seen, with the exception of the consequence of alveoli being unable to recoil. Most candidates were aware that alveoli break down, although some wrote vaguely about 'damaged alveoli'. The effect of this on surface area or diffusion was also well known. Better candidates usually wrote about the loss of elastin and the inability of the alveoli to recoil or force air out of the lungs. However, some candidates focused on increased difficulty to inhale air due to the loss of elastin. This was not credited. Weaker candidates were usually aware that less oxygen enters the blood but they often disqualified the last marking point by stating that 'less energy is *produced*'. A minority confused emphysema with asthma or linked a lack of oxygen with 'the heart having to work harder'.

### **Mark Ranges and Award of Grades**

Grade boundaries and cumulative percentage grades are available on the [Results statistics](#) page of the AQA Website.